Federation of Earth Science Information Partners
Guide to Winter Conference 2008

January 9-10, 2008
Embassy Suites Convention Center
Washington, D.C.

Federation of Earth Science Information Partners

MAKING DATA MATTER

Table of Contents

The Federation of Earth Science Information Partners gratefully acknowledges NASA, NOAA and EPA for their generous support. We also thank our cluster leads, technical leads, speakers, and countless volunteers that continue to contribute their time and talents to make our organization great.

Breakout Session Descriptions

Air Quality Cluster Meeting

Facilitated by Stefan Falke and Rudy Husar

Session Topics

- Introduction and overview of the ESIP Air Quality Cluster Activities
- Capturing air quality project networking through metadata pages
  - Creating AQ Network Connections through metadata pages
  - Example DataSpaces and DataSheets
  - Relationship to metadata catalogs
  - Registration in catalogs (GCMD, GOS, ESG, ECHO, GEOSS)
  - Use in Portals (EIE, etc.)
- ESIP preparation for the EPA Air Quality Data Summit
  - How do we define ESIP's role in the broader air quality community
- Overview of demo session at the evening reception

Building Better Metadata

- FGDC and ISO Geospatial Metadata Standards – Ted Habermann
- The Proliferation of Metadata Standards and the Evolution of NASA's Global Change Master Directory (GCMD) Standard for Uses in Earth Science Data Discovery - Jianpinig Mao

Carbon Cycle Cluster Meeting

Moderator: Ed Sheffner – Deputy Chief, Earth Science Division, NASA Ames Research Center, former Program Manager for Carbon Management, NASA HQ.

Carbon in the atmosphere is increasing because of emissions from power plants and transportation and changes in land cover and land use. The increase in atmospheric carbon, especially carbon dioxide and methane, is the primary contributor to the rise in global temperatures and climate change. Policy decisions are being made now on how to mitigate the changing carbon regime by reducing emissions and increasing carbon sequestration in geologic structures and in terrestrial and oceanic ecosystems. Actions taken to reduce emissions and increase or stimulate carbon sequestration assume the capability to measure, monitor and verify the results in the near term and long term. For example, existing carbon trading approaches assume that the amount of carbon absorbed from the atmosphere and stored in forests or agricultural soils can be easily and accurately measured, and that the carbon, once stored, will remain out of the atmosphere indefinitely. Similarly, carbon dioxide scrubbed from the atmosphere or removed from stack emissions and stored underground must be monitored to assure that the carbon is stable and not leaking into the atmosphere.

Tools and systems to assist resource managers make decisions regarding the potential for carbon management and to monitor the results are becoming more prevalent and accurate. These systems usually involve a combination of in situ measurements with geo-spatial and geo-statistical methodologies that extend site specific measurements over large areas. This session will examine issues related to carbon management and consider the goals and objectives for an ESIP Federation cluster – a cluster that would help decision makers implement policies to reduce carbon emissions and facilitate carbon sequestration. Time permitting, the session will also consider expanding the purview of the cluster to regional climatology i.e., how to provide decision makers with information on changes in regional climates in a manner and time frame that would support major decisions on land use, resource management, and other regional planning issues.

Client-Side Tech Infusion and DIAL Demo

Facilitated by Bruce Caron

"All software sucks," Jaron Lanier is famous for saying... This is his way of telling users to demand more from their software designers.

The Client Side Technology Infusion [CSTI] Working Group looks directly at issues of data access, analysis, and display in the world outside the Internet browser environment. Today, as it was ten years ago, probably 95% of the scientists who use NASA/NOAA (etc.) data sets do so with commercial software products such as Matlab, IDL, ENVI, or ARCgis. These products represent an enormous investment in code. This code is supplemented by shared user code libraries (such as the IDL Astronomy User's Library at GSFC). While new browser-based data access efforts are making real progress as alternative data use portals, there remains a need to help the top commercial and open-source vendor/developers respond to new standards (such as the OGC services) and potentials for interoperability (such as KML export).

We spend hours and weeks and years of our lives struggling with IDL or ARCgis because these packages already solve so many of the problems we encounter connecting to data resources. Even the web-service developers use these to manage data manipulation on the server side. Every now and then (sometimes more often than not) we find ourselves in complete agreement with Jaron.

Bring your data access need/opportunity to this breakout session and join in the discussion on how the CSTI might help the data analysis software you use every day suck less...

As a demonstration of how COTS software can be extended to serve new users, the DIAL technology takes runtime IDL and marries this to Adobe Director (a multimedia software AUTHORING environment) with the aim of creating a data access/analysis/visualization authoring engine that your project/agency can use to create stand-alone applications.

Bruce Caron will give the demo and lead the CSTI discussion.

Developing an Ontology for Services

Facilitated by Peter Fox

- Classifying services and describing service interfaces to support "smart" workflow composition (presentations by Liping Di & Rahul Ramachandran & Peter Fox & Rob Raskin)
- Begin development of core services ontology based on our use cases
- Exchange experiences with semantic software stacks (triple stores, inference engines, rules engines, etc.)

Development of Interoperable Application Components Through JSR-168 Standard

- UAH Portal Development/Interoperability - Ken Keiser or other UAH Rep
- EIE Portal Development/Interoperability – Phil Yang

Registering Data and Services (GCMD, GOS)

- Registering Earth Science Data and Data Related Services Using NASA's Global Change Master Directory (GCMD) - Tyler Stevens
- GOS Registration Model(s) (harvesting, metadata upload) - John Kozimor
- Registering air quality web services with metadata catalogs – Stefan Falke

Semantic Web

Facilitated by Peter Fox

- Developing ontologies (has some use case elements in it)
- Query Languages

- Rules
- Use cases for semantic web development

Water Management Cluster Meeting

Session Leaders: Tim Owen, NOAA/NCDC and Will Pozzi, CREW/WaterNet
Session Rapporteur: Carol Meyer, ESIP Federation
Session Objectives:

- To connect portal and ontological development in water management with user requirements for products, services, and data discovery tools; and
- To consider these connections in the context of an emerging climate cluster (to include water management, air quality, and the carbon cycle)

Potential Discussion Topics

- Ontologies
- Metadata/registries
- Inventories
- Knowledge directories
- Data discovery from GCMD portal perspective (ECV, WaterNet, CUASHI)
- On-line catalogues, networking, and screen scraping capabilities
- Standards and service-oriented architecture (USGEO/ADM perspectives)
- Matching resources (data tools, models, research papers, visualization overlays) with accessibility (RISA/AASC/REACT perspectives)
- Semantic capabilities – textual and graphic – of targeted user groups

Poster and Demo Abstracts

Accessing Satellite-Derived Surface Ocean Data Fields via Matlab (Demo)

Authors: Peter Cornillon, Meri Sheremet, Christian Buckingham, Dan Holloway and Carl Wolfteich

Abstract: Graphical User Interfaces (GUIs) have been written in Matlab for a number of oceanographic sea surface fields. The data sets associated with these fields are often quite involved. The GUIs are designed to facilitate navigation through these data sets and then to allow the user to download the data subset of interest. As part of the selection process, the user must also choose between instantiating the data in the Matlab workspace in their native structure or in a structure defined by the project. The latter is consistent across all of the GUIs and greatly facilitates working with several different parameters acquired from different sources. GUIs have been written for SST data sets, wind data sets and surface fluxes. These will all be demonstrated.

AIRNow and the San Diego Wildfires (Demo)

Author: John E. White

Abstract: This demo will show how the AIRNow program was a valuable tool for state and local air agencies during the October 2007 San Diego wildfires for data analysis, forecasting, and disseminating critical air quality information to the media and public.

AirNow International – Real-Time Air Quality Data and Forecasts to Protect Global Public Health

Author: Gary Foley, Ph.D.

Abstract: Air. The average adult breathes 13,000 liters each day. Yet poor air quality is an insidious problem. To better protect public health by providing real-time air quality data and forecasts, the U.S. Environmental Protection Agency (EPA) created the AIRNow program in 1995. Growing from a small regional program with three data polls each day, AIRNow today is a nationwide program featuring hourly data, hundreds of maps, forecasts, and other vital information on air quality. An Air Quality Index makes real-time data meaningful to the general public. As a color-coded scale that ties air quality concentrations to health effects, the Air Quality Index ranges from "good" and "moderate" to "unhealthy for sensitive groups," "unhealthy," "very unhealthy" and "hazardous." When the Air Quality Index registers "unhealthy," everyone may experience some health effects. "Hazardous" signals emergency conditions. To complement this index and help improve public health, EPA provides training, outreach and educational materials about the health implications of poor air quality.

Since many countries have expressed interest in the AIRNow system, AIRNow-International, or AirNow-I, has been developed to bring the immense experience gained in real-time data-sharing, processing and distribution to other parts of the world. With AIRNow-I, distribution will be addressed with a version of easy-to-install AIRNow software that includes data processing, quality control, system monitoring, and mapping. In addition to bringing air quality information to the public in countries that do not currently have access to this information, AIRNow-I's data-sharing capabilities can be extremely useful to the air quality research community. As different local entities begin to share air quality information, new discoveries can be made about the behavior and causes of regional air pollution. AIRNow-I holds promise of becoming a catalyst for world-wide integration and standardization of real-time air quality data. With agreed upon standards for sharing data, AIRNow-I can interface seamlessly with existing systems. In different countries, AIRNow- I can also become a national focal point for communicating air quality conditions, forecasts and healthy suggestions to decision-makers, the press and the public.

An Advanced Archival and Distribution System for Global Atmospheric Science Research and Applications

Authors: James W. Closs, Walt Baskin

Abstract: NASA's Atmospheric Science Data Center at the NASA Langley Research Center has developed a new state-of-the-art data archival, and distribution system to serve the atmospheric sciences data provider and user communities. The new system, called Archive – Next Generation (ANGe), is replacing two large-scale science data management systems, and is designed with a distributed, multi-tier, serviced-based, message oriented architecture enabling new methods for searching, accessing, and customizing data. The previous two systems required a user to actively manage a session in a web browser to sequentially search for and obtain data. The ANGe system is architected to allow programmatic calls to the archive via web services to obtain multiple data sets of interest to the user. Web service access to the archive enhances the user's ability to utilize multiple data sets managed at different locations via a Grid computing environment. This technology distributes computationally intensive data processing for large data sets, and greatly improves the efficiency of extracting smaller pieces of data of interest to a specific study. Geospatial metadata is managed in a PostGIS-enabled database, allowing for integration with mainstream GIS utilities and applications. The Atmospheric Science Data Center is also producing custom value-added data products and tailoring access to information and data to meet the needs of a diverse user community. Details of these new data access tools and capabilities, and planned enhancements will be discussed.

The Atmospheric Science Data Center in Langley's Science Directorate leads NASA's program for the processing, archival and distribution of Earth science data in the areas of radiation budget, clouds, aerosols, and tropospheric chemistry. The Data Center was established in 1991 to support NASA's Earth Observing System and the U.S. Global Change Research Program. It is unique among NASA data centers in the size of its archive, cutting edge computing technology, and full range of data services.

An Improved Data Reduction Tool in Support of the Real-Time Assimilation of NASA Satellite Data Streams

Authors: Rahul Ramachandran, Xiang Li, Sunil Movva, Sara Graves; ITSC/UAH; Bradley Zavodsky, UAH; Steven Lazarus, Michael Splitt, Mike Lueken, Florida Institute of Technology; William Lapenta, MSFC/NASA

Abstract: Today's research and operational forecast models and data assimilation systems have difficulty ingesting and utilizing large volumes of satellite data, in part due to prohibitively large computational costs, time constraints and bandwidth issues. To address this problem, NASA funded a project aimed at refining, testing and customizing an existing automated Intelligent Data Thinning (IDT) algorithm, developed at the University of Alabama in Huntsville (UAH), in conjunction with commonly used data assimilation systems for numerical weather prediction models. The most significant measure of a successful data reduction algorithm is its ability to retain valuable information – that which has maximum impact on the model forecast – while simultaneously reducing the data volume. The IDT algorithm is specifically designed to retain information-dense regions of a data set while removing redundant data. This recursive simplification algorithm, is based on the computer graphics concept of data decimation, retains data within regions of high spatial frequency (large variances), while subsampling regions of low spatial frequency (low variances) to thin the data.

The goal of this project is to test, refine and customize the existing IDT algorithm in order to transition it into a deliverable data reduction tool useful for real-time applications with a wide variety of dense NASA satellite data streams in operational, research, and private industry communities. The project tasks include: (1) performing sensitivity analysis on IDT with selected data assimilation systems, (2) customizing IDT for use with selected multidimensional NASA satellite data sets, and (3) evaluating IDT's performance with end-to-end analysis and numerical weather prediction model experiments. The NASA Short-term Prediction Research and Transition (SPoRT) Center, with its resident research scientists, forecast models, and real time data feeds, has been chosen as the ideal environment for operational testing of this tool. The refinements made to the IDT algorithm and the results from this project will be presented in this poster.

Biodiversity and Emerging/re-emerging Disease – What are the Impacts of Climate Change?

Authors: Gary Foley, Ph.D., Montira Pongsiri, Ph.D., MPH

Abstract: In support of the Group on Earth Observations (GEO), the U.S. EPA developed an interdisciplinary research initiative to study the links between changes in biodiversity and risks to public health, which could result in linking relevant earth observations to forecasting the increase of certain risks. Although humans depend on natural ecosystems and the services they provide, our actions in the past 50 years have changed these systems to an unprecedented degree, altering habitats, reducing biodiversity and putting ecosystem services at risk. At the same time, infectious diseases are emerging at an increasing rate. A common, defining feature of many of these diseases is that they are triggered by anthropogenic changes to the environment. What are the mechanisms underlying disease emergence, and do changes in biodiversity play a role? Climate change is likely to have direct effects on biodiversity, migration routes, disease agents, vectors, and hosts. In what situations are climatic changes expected to affect biodiversity and health?

EPA's research initiative is aimed at characterizing the underlying mechanisms of disease emergence using an interdisciplinary, community of practice approach involving researchers and practitioners in public health, ecology, social sciences and remote sensing. Through the sponsorship of long-term research studies and pilot projects in and outside of the U.S., EPA is testing the relationships between anthropogenic stressors like climate change and deforestation, changes in biodiversity, and increased incidence of vector-borne diseases such as Lyme disease, West Nile virus, and malaria. Expected results from research projects include improved understanding of the causal mechanisms that link changes in biodiversity and infectious disease transmission; use of earth observation and field data to track and analyze the relationship between habitat alteration, biodiversity loss, vector ecology, and the emergence and spread of infectious disease; the development of tools that use the most up to date data to help forecast risks of infectious disease; new knowledge that can be used to value biodiversity as it relates to human health; improved strategies and communication that can encourage changes in human behavior to help reduce biodiversity loss and to decrease exposure to disease risks; and improved coordination and information exchange between environmental decision-makers and public health practitioners. Societal benefits such as conserving biodiversity and understanding the environmental factors that affect human health and well-being are interconnected – studied in the same context, new knowledge can be produced to identify new policy options to adapt to, mitigate and prevent adverse effects on health and the environment.

This initiative presents an opportunity to integrate the science from multiple disciplines, to produce near real-time GEOSS-powered tools to forecast when biodiversity is changing in a potentially detrimental way, to alert public health officials and the public, and to make an economically sound case for the value of ecosystem services, such as biodiversity, in terms of human health benefits.

Demonstrating Collaborative Decision Tools for Real-Time Fire Monitoring During the 2007 Southern California Firestorms

Authors: Vincent G. Ambrosia, Donald V. Sullivan, Francis Enomoto, Edward Hildum, and Sally Buechel

Abstract: For the past five years, NASA and the USDA Forest Service have been collaborating on a NASA funded endeavor to increase the observational capabilities of the Nation's wildfire management teams. The Wildfire Research and Applications Partnership (WRAP) project focused on improving wildfire monitoring capabilities, using NASA-derived and developed tools and instrumentation for improved decision support. In order to achieve those goals the team developed a new NASA sensor system, operating aboard the new NASA *Ikhana* high-altitude, long-duration Unmanned Airborne System (UAS).

When the Southern California Firestorms started last October, the WRAP project team was asked to support the Forest Service to provide critical fire-related geospatial data to first responders. The team supported a total of four missions over eleven fires (each day), during a five day period in Southern California, providing real-time fire information.

This poster and demonstration will showcase the support to the southern California wildfire suppression activities, the capabilities of the new NASA wildfire sensor system, the new NASA *Ikhana* UAS science platform, and the Collaborative Decision Environment (CDE) tools used to integrate information elements into a cohesive, simple, visualization package.

Developing a Semantic Web Hype Cycle for Earth Science Applications

Authors: Peter Fox (pfox@ucar.edu), Steve Olding and the semantic web sub-group

Abstract: One of the new tools being utilized in the Earth Science Data Systems Technology Infusion working group, sub-group on process and strategies is the Gartner group's Hype Cycle for emerging technologies. Working in conjunction with the process and strategies group, the semantic web sub-group has developed a Hype Cycle for the semantic web as applied to Earth Science. The Hype Cycle is represented as a two-dimensional line graph with Time (maturity) on the horizontal axis and Visibility on the vertical axis. This poster will introduce the Hype Cycle concept and elements, and discuss placement of semantic web technical components on the graph. Additionally, each element is color-coded as an estimate of time to maturity. This Hype Cycle for semantic web will be reviewed by knowledgeable, but non-semantic-web, experts. The intent for the Hype Cycle is to be used by prospective technology integrators to assess suitability and maturity of semantic web for their application(s). Viewers of this poster are encouraged to make comments, and annotate the poster directly. Writing materials will be provided.

DIAL Technology: Data Rich Application Authoring tools for NASA Projects

Authors: Bruce Caron, Marty Landsfeld

Abstract: The Data and Information Application Layer (DIAL) ACCESS project uses plug-in technology to add NASA data visualization and access tools to the Adobe Director™ multimedia application authoring environment. This means that, with a little additional work, stand-alone data-rich applications can be authored as easily as any other software authored using Director™. Bruce Caron will demonstrate how this authoring system works, and what it means to visualization tool builders and end users.

Under the hood of the DIAL technology are two (soon to be three) pieces of commercial, off-the-shelf software: Adobe Director™, ITTVis IDL™, and ESRI ArcEngine™. A small plug-in to Director™ links this to IDL™ or (soon) ArcEngine™. Licence agreements with ITTVis and ESRI make the resulting applications free for educational use and distribution. DIAL currently uses the OPeNDAP client in IDL™ for data access. Emerging WCS capabilities within IDL™ and ArcEngine™ will expand data access options.

The DIAL project is a technology infusion effort. We are building a community of developers looking to bring new data resources to their users. The IDL plug-in and ESRI plug-in to Director™ will be made available for free to NASA partners for non-commercial end use. Other uses will require licensing agreements. The IDL and ArcEngine licenses are for educational use, but other agreements can be negotiated. DIAL puts the power of IDL and ArcEngine into the hands of students and the public through user interfaces that a simple and easy to use.

Discover Climate Data through NASA's Global Change Master Directory

Authors: Lola Olsen 1, Scott Ritz 2, Jianping Mao 2, Tyler Stevens 2

1 Global Change Master Directory, NASA Goddard Space Flight Center, Code 610.2, Greenbelt, MD 20771

2 RS Information Systems, NASA NASA Goddard Space Flight Center, Code 610.2, Greenbelt, MD

Abstract: NASA's Global Change Master Directory (GCMD, http://gcmd.nasa.gov) offers users the ability to discover climate data and services using a normalized approach to the search using controlled sets of keywords. These include science keywords for topics covering all the Earth Science disciplines along with keywords for projects, data centers, instruments, locations, spatial/temporal coverage, and spatial resolution.

We will demonstrate a search for climate data using the refinement capability provided through the GCMD's set of spatial resolution keywords. By using spatial resolution refinements, users can more quickly locate data based on their desired scale of study. Data validation and data inter-comparison can be expedited and enhanced by this capability.

The GCMD works with scientific organizations in generating subset views of the directory through portals (http://gcmd.nasa.gov/Data/portal_index.html). These portals provide access to selected subsets of data, model output, and services to meet the needs of researchers, planners, policy makers, educators, etc.
This demonstration features a collaboration that was initiated with NOAA's National Climatic Data Center. The directory entries, harvested from NOAA's Metadata Manager and Repository, have been populated with the applicable spatial resolution keywords to make this search effective.
Populating the resolution field for all directory entries remains a challenging task.

EOSDIS Data Metrics Collection

Authors: Jeanne Behnke, John Moses, Kevin Murphy, Edwin Sofinowski, Beth Weinstein, Carol Boquist, H. K. Ramapriyan

Abstract: This poster describes the metrics system in place at EOSDIS to track the performance at the EOSDIS data centers. EOSDIS has been collecting and analyzing information for more than 10 years.

GeoBrain for Facilitating Earth Science Higher Education

Authors: Meixia Deng, Liping Di

Abstract: Funded by NASA, GeoBrain is a geospatial information and knowledge system being developed by a project team led by CSISS at George Mason University for facilitating higher education in Earth system science. Latest Web services and knowledge management technologies have been adopted and implemented in the system for providing innovative methods in publishing, accessing, visualizing, and analyzing geospatial data and in building/sharing geoscience knowledge. GeoBrain establishes an unique online data-intensive learning and research environment freely available to users all over the world.

Multi-Sensor Data From A-Train Instruments Brought Together for Atmospheric Research

Authors: Steven Kempler, Peter Smith, Graeme Stephens, Andrey Savtchenko, Gregory Leptoukh, Hualan Rui , John Farley, David Winker, Don Reinke

Abstract: The A-Train is comprised of a series of instruments, developed independently, that measure highly related atmospheric components along the same flight path. In order to intercompare data from this multitude of sensors, researchers must access, subset, visualize, analyze and correlate distributed atmosphere measurements from the various A-Train instruments. The A-Train Data Depot (ATDD) has been operational for over a year, successfully performing the aforementioned functions on behalf of researchers, thus providing co-registered data

from the Cloudsat, CALIOP, AIRS, and MODIS instruments for further intercomparisons. Of late, significant data from OMI and POLDER are now included in the 'depot'. By specifying the desired spatial and temporal range, the researcher can subset, visualize, co-register, and access multi-sensor A-Train data related to: Cloud, aerosol, atmospheric temperature, and water vapor parameters (vertical profile visualizations); Cloud Pressure, cloud top temperature, water vapor, cloud optical thickness, and aerosol products (horizontal strips subsetted +/- 100km from the profile visualizations), and; Cloud pressure parameters (2-D line plots overlayed on the vertical profiles). All data is plotted using the GIOVANNI data exploration tool. A new feature of GIOVANNI is its ability to have collocated and subsetted data sets as well as PNG image files downloaded to the researcher's computing facility. By providing a convenient way to visualize and acquire multi-sensor data, ATDD affords users more time and effort to further their research.

NASA Technology Infusion Working Group: Roadmap for Semantic Web

Authors: Peter Fox (pfox@ucar.edu) and the semantic web sub-group

Abstract: As part of the assessment and planning for infusing new technologies in support of Earth Science Data Systems, the Technology Infusion working group, sub-group on semantic web has developed a roadmap relating current and near future technical developments to the NASA Technology Infusion Capability Vision. This poster will present the background material, introduce terminology and technology components, relate these to the capability vision elements and finally layout the semantic web roadmap including timing and impacts on Earth Science.

NEW Planetarium Programs for Polar Informal Science Education

Authors: Carolyn Sumners, Houston Museum of Natural Science; Annette Schloss, University of New Hampshire; Patricia Reiff, Rice University and Discovery Domes

Abstract: The ESIP Federation offers great networking potential between individuals and organizations that may not be aware of each others' work. This paper presents a collaborative effort by ESIP partners, with funding from the National Science Foundation, to create educational programs for the International Polar Year (IPY). The modern planetarium is an immersive full-dome theater that can take audiences to Polar Regions in the past,

present, or future and can simulate dynamic polar events. With the goal of public engagement and education, we are producing two programs: Night of the Titanic and Ice Worlds. Night of the Titanic uses a famous tragedy to uncover the science that could have saved the ship and the changing conditions in the North Atlantic over the last century. This program also fosters discussion about how humans evaluate data and make critical decisions related to the changing condition of polar ice. Ice Worlds uses comparative planetology themes to present Earth in the context of all ice worlds in the solar system, thus providing a broader perspective for analysis of changes in Earth's Polar Regions. Both programs rely on themes of high public interest to drive attendance and engagement. Both programs are being developed for the large dome theater or planetarium market and for portable Discovery Domes, which can reach urban and rural audiences throughout the world. This paper focuses on techniques for presentation of rigorous science content in a context that will engage the general public as well as school groups over a wide age range.

NO2 Desktop Data Explorer (Demo)

Author: Marty Landsfeld

Abstract: The NO2 Desktop Data Explorer Prototype will allow NASA and EPA professionals to browse the available NO2 data for the US and request the features that decision makers need to use these data in their workplaces.

The Data Explorer uses OMI NO2 data from the Goddard Data Pool, and updated data from the DataFed. In the future these will be suplemented by other NO2 column data (GOME, etc.) and EPA ground sensor data sets (to be determined).

Online Impact Prioritization of Essential Climates Variables on Climate Change

Authors: Shane P Forsythe-Newell*, Bruce R Barkstrom, Ken Roberts

Abstract: The NOAA-NCDC Scientific Data Stewardship (SDS) Team has developed an online prototype that is capable of displaying the “big picture” perspective of all Essential Climate Variable (ECV) impacts on society and the IPCC. This SDS model prototype provides the ability to visualize global ECV information with options to drill

down in great detail. It offers a quantifiable prioritization of ECV impacts that potentially may significantly enhance collaboration with respect to dealing effectively with climate change. The SDS Prototype assures anonymity and provides an online input mechanism for subject matter experts and decision makers to access, review and submit: (1) ranking of ECV's, (2) new ECV's and associated impact categories and (3) feedback about ECV's, satellites, etc.

Input and feedback is vetted by experts before changes or additions are implemented online. The SDS prototype also provides an intuitive one-stop web site that displays past, current and planned launches of satellites; general and detailed information in conjunction with imagery. The version 1.0 release provides an easy "at-a-glance" interface to rapidly identify gaps and overlaps of satellites and associated instruments monitoring climate change ECV's. The SDS version 1.1 will enhance depiction of gaps and overlaps with instruments associated with In-Situ and Satellites related to ECV's. NOAA-NCDC's SDS model empowers decision makers and the scientific community to rapidly identify weaknesses and strengths in monitoring climate change ECV's and potentially significantly enhance collaboration.

Operational CMAQ-based Air Quality Forecasts--Toward Assimilation of NASA Satellite Data (Demo)

Author: John N. McHenry

Abstract: This demonstration will provide a routine look at Baron Advanced Meteorological Systems' daily real-time operational PM/aerosol forecasts using the CMAQ modeling platform. It will also provide an early look at prototype real-time MODIS Deep-Blue aerosol retrievals as projected onto one of the CMAQ grids in preparation for data-assimilation. This work is funded under NASA cooperative agreement NNA07CN15A

PO.DAAC Physical Oceanography Distributed Active Archive

Authors: P. Liggett, M. Kessling

Abstract: Satellite Observations of the Ocean. Data Sets archived and distributed by PO.DAAC. Sea Surface Temperatuce, Ocean Surface Topography, Ocean Vector Winds

.

Providing a Virtual Tour of a Glacial Watershed (Demo)

Authors: Matt Heavner, Logan Berner, Marijke Habermann, Ed Knuth, Eran Hood, Rob Fatland

Abstract: SEAMONSTER, a NASA AIST funded sensor web project, is the SouthEast Alaska MOnitoring Network for Science, Telecommunications, Education, and Research. Seamonster is leveraging existing open-source software and is an implementation of existing sensor web technologies intended to act as a sensor web testbed, an educational tool, a scientific resource, and a public resource. The primary focus area of initial SEAMONSTER deployment is the Lemon Creek watershed, which includes the Lemon Creek Glacier studied as part of the 1957-58 IPY.
This demo shows our year one efforts to maximize education and public outreach activities of SEAMONSTER. During the first summer, 37 sensors were deployed throughout two partially glaciated watersheds and facilitated data acquisition in temperate rain forest, alpine, lacustrine, and glacial environments. Understanding these environments are important for public understanding of climate change. These environments are geographically isolated, limiting public access to, and understanding of, such locales. In an effort to inform the general public and primary educators about the basic processes occurring in these unique natural systems, we are developing an interactive website. This web portal will supplement and enhance environmental science primary education by providing educators and students with interactive access to basic information from the glaciological, hydrological, and meteorological systems we are studying. In addition, we are developing an interactive virtual tour of the Lemon Glacier and its watershed. This effort will include Google Earth as a means of real-time data visualization and will take advantage of time-lapse movies, photographs, maps, and satellite imagery to promote an understanding of these unique natural systems and the role of sensor webs in education. Scientific and management users can also use the infrastructure for data access and sensor web interaction for their needs.

Search Earth Science Data Sets and Data Related Services Using NASA's Global Change Master Directory (GCMD) (Demo)

Authors: Tyler Stevens and Scott Ritz

Abstract: NASA's Global Change Master Directory contains descriptions of data sets related to global climate change and Earth science research. This demonstration will illustrate how to conduct a search within the directory

and directly access to data, data services and how to use the metadata authoring tool to create a metadata document that can be searched and accessed in the GCMD.

Semantically-Enabled Science Data Integration

Authors: Peter Fox (pfox@ucar.edu), Deborah McGuinness, Krishna, Sinha, Robert Raskin, Luca Cinquini, Patrick West

Abstract: The vast majority of explorations of the Earth system are limited in their ability to effectively explore the most important (often most difficult) problems because they are forced to interconnect at the data-element, or syntactic, level rather than at a higher scientific, or semantic, level. In many cases, syntax-only interoperability IS the state-of-the-art. Currently, in order for scientists and non- scientists to discover, access, and use data from unfamiliar sources, they are forced to learn details of the data schema, other people's naming schemes and syntax decisions. These constraints are limiting even when researchers are looking for information in their own discipline, but they present even greater challenges when researchers are looking for information spanning multiple disciplines, including some in which they are not extensively trained. Our project, the Semantically-Enabled Scientific Data Integration (hereafter SESDI), aims to demonstrate how ontologies implemented within existing distributed technology frameworks will provide essential, re-useable, and robust, support necessary for interdisciplinary scientific research activities.

Solutions for Mining Distributed Scientific Data (Demo)

Authors: Rahul Ramachandran, Manil Maskey, Ken Keiser and Sara Graves; University of Alabama in Huntsville; Christopher Lynnes and Long Pham; Goddard Earth Sciences Data and Information Services Center

Abstract: Researchers at the University of Alabama in Huntsville (UAH) and the Goddard Earth Sciences Data and Information Services Center (GES DISC) are working on approaches and methodologies facilitating the analysis of large amounts of distributed scientific data. Despite the existence of full-featured analysis tools, such as the Algorithm Development and Mining (ADaM) toolkit from UAH, and data repositories, such as the GES DISC, that provide online access to large amounts of data, there remain obstacles to getting the analysis tools and the data together in a workable environment. Does one bring the data to the tools or deploy the tools close to the data?

The large size of many current Earth science datasets incurs significant overhead in network transfer for analysis workflows, even with the advanced networking capabilities that are available between many educational and government facilities. The UAH and GES DISC team are developing a capability to define analysis workflows using distributed services and online data resources.

We are developing two solutions for this problem that address different analysis scenarios. The first is a Data Center Deployment of the analysis services for large data selections, orchestrated by a remotely defined analysis workflow. The second is a Data Mining Center approach of providing a cohesive analysis solution for smaller subsets of data. The two approaches can be complementary and thus provide flexibility for researchers to exploit the best solution for their data requirements.

The Data Center Deployment of the analysis services has been implemented by deploying ADaM web services at the GES DISC so they can access the data directly, without the need of network transfers. Using the Mining Workflow Composer, a user can define an analysis workflow that is then submitted through a Web Services interface to the GES DISC for execution by a processing engine. The workflow definition is composed, maintained and executed at a distributed location, but most of the actual services comprising the workflow are available local to the GES DISC data repository. Additional refinements will ultimately provide a package that is easily implemented and configured at additional data centers for analysis of additional science data sets.

Enhancements to the ADaM toolkit allow the staging of distributed data wherever the services are deployed, to support a Data Mining Center that can provide additional computational resources, large storage of output, easier addition and updates to available services, and access to data from multiple repositories. The Data Mining Center case provides researchers more flexibility to quickly try different workflow configurations and refine the process, using smaller amounts of data that may likely be transferred from distributed online repositories. This environment is sufficient for some analyses, but can also be used as an initial sandbox to test and refine a solution before staging the execution at a Data Center Deployment.

Detection of airborne dust both over water and land in MODIS imagery using mining services for both solutions will be presented. The dust detection is just one possible example of the mining and analysis capabilities the proposed mining services solutions will provide to the science community. More information about the available services and the current status of this project is available at http://www.itsc.uah.edu/mws/ .

The SEAMONSTER Sensor Web: Lessons and Opportunities after One Year

Authors: Matt Heavner, Eran Hood, Rob Fatland, Cathy Connor

The SouthEast Alaska MOnitoring Network for Science, Telecommunications, Education, and Research, or SEAMONSTER, is a NASA Earth Science Technology Office funded effort to deploy a sensor web in Southeast Alaska. One of the major benefits of this project is the potential for testbed applications for sensor web and sensor technologies is a harsh yet accessible environment. Another key aspect of SEAMONSTER is the project's illustration of the key differences between a sensor network and a sensor web. After the initial year of work on the project, we have instrumented the partially glaciated watershed of Lemon Creek, near Juneau, Alaska. The initial goal of this project is to develop a sensor web for monitoring the Lemon Glacier and its outlet stream, Lemon Creek. The sensor web is built upon a network of sensors with real time communication between nodes and semi-autonomous reconfigurability based on the information shared between nodes. The sensor web is designed to provide long term monitoring that is sensitive to local conditions to accurately record transient events with dynamic use of available resources (e.g. power, storage, communications bandwidth). Specifically, the sensor web described in this presentation allows us to develop our understanding of glacier hydrology and the influence of glacial runoff on the hydrology and hydrochemistry of Lemon Creek. This effort directly contributes to understanding the impact of changing glacier coverage of terrestrial ecosystems and the impacts on coastal productivity. The backbone of the sensor web is composed of Vexcel/Microsoft Microservers. These low-power servers are base stations with support for sub-networks, server support with respect to the rest of the network, and server behavior with respect to network-external contact. This presentation describes the methods we have used to build the SEAMONSTER sensor web, lessons learned after one year, future directions for the sensor web, and illustrate and solicit collaborations to utilize the testbed potentials of SEAMONSTER.

The Southeast Climate Consortium: Serving the Climate Information Needs for Agricultural and Natural Resource Managers

Authors: K.T. Ingram, J.W. Jones, J.J. O'Brien, D. Letson, G. Hoogenboom, J. Christy, J. Novak

Abstract: The mission of the Southeast Climate Consortium (SECC) is to use advances in climate sciences, including improved capabilities to forecast seasonal climate, to provide scientifically sound information and decision support tools for agriculture, forestry, and water resources management in the Southeastern USA.

Current members of the SECC are the University of Florida, Florida State University, University of Miami, University of Georgia, Auburn University, and University of Alabama-Huntsville. As a multidisciplinary, multi-institutional team, the SECC conducts research and outreach to a broad community of potential users and forms partnerships with extension and education organizations to ensure that SECC products are relevant and reliable. The SECC is organized into five program areas: Climate, Agricultural Research, Agricultural Extension, Water Resources Management, and Decision Analysis. The centerpiece through which the SECC communicates with potential users of climate information is AgClimate, a web-based decision support system [http://AgClimate.org]. AgClimate presents information on climate variability, effects of climate on certain agricultural commodities and forests.

Another SECC product is CoastalClimate [http://CoastalClimate.org], which presents information on climate conditions of interest to a broad range of stakeholders for 100 miles on either side of the coast from North Carolina southward around the Florida peninsula thru Alabama.
In addition to receiving strong support from the three states, the SECC receives funding from the National Oceanic and Atmospheric Administration, USDA Risk Management Agency, and USDA Collaborative Research, Education, and Extension Services.

Stormwater and Semantics: Involving the community in collection and adapting policy to encourage participation

Author: Danielle Forsyth

Abstract: Stormwater is not very interesting to the average resident; they just don't think about runoff until watersheds are polluted and fees are levied to dig up the streets and add more pipes. What if a green solution could replace this gray approach? This poster describes a community centered application (and semantically driven by a dynamic decision support system) deployed in several urban areas.

Stormwater Semantics (Demo)

Author: Danielle Forsyth

Abstract: Interactive semantically driven application for making stormwater collection a priority in all urban areas

Technology Infusion Working Group

Authors: Steve Olding, Karen Moe, Chris Lynnes

Abstract: An update on the recent activities of the Earth Science Data Systems Technology Infusion Working Group.

Web Resources for Sharing and Analyzing Information about Smoke from the Southern California Wildfires (Demo)

Authors: Stefan Falke and Rudolf Husar

Abstract: Drought and Santa Ana winds created a perfect fire situation in Southern California. A wealth of information on the event is dispersed over the Web. A wiki was created to capture information resources on the smoke and its air quality impacts. The wiki allows the community at large to contribute and use the resources to analyze and learn about smoke and air quality. The experience in capturing information generated and used in response to a large event can help define the interfaces, standards, tools, and processes of a GEOSS network.

About Our Speakers

Myra Bambacus
Program Manager, NASA Geosciences Interoperability Office

Myra Bambacus is the Program Manager of NASA's Geosciences Interoperability Office. The GIO directly supports the Applied Science Program under the Science Mission Directorate. Ms. Bambacus leads the interoperability development and implementation efforts towards systematically extending the use of predictions and observations, resulting from NASA research, to enhance decision support in National and International societal benefit areas of applications.

Over the past 23 years, Ms. Bambacus has served in a variety of leadership positions including, NASA's Senior Agency Official for Geospatial Information, Executive Director for Geospatial One Stop (Acting), Program Manager for NASA's Digital Earth Office; External Alliances Manager for the Technology Commercialization Office; Director of Program Integration in the Office of the Administrator, Chief Information Office; Deputy Director of NASA's Contract Management; acting Procurement Officer for the International Space Station; and Chair of the FGDC's Geospatial Applications and Interoperability Working Group. Ms. Bambacus's career has encompassed both the Department of Defense and NASA, including the Air Force's Space Systems Division and the Army's Aberdeen Proving Ground. In these positions, she worked in major systems acquisitions, commercialization, outsourcing, and program management. Ms. Bambacus is also a Senior Fellow in the Excellence in Government Program.

Ms. Bambacus currently serves as NASA's representative to the Federal Geographic Data Committee's (FGDC) Coordination Group, and NASA's Strategic/ Planning Committee Member to the Open Geospatial Consortium. She is also involved in influencing the Global Earth Observations and Systems of Systems concepts from an architectural and Standards perspective all to broaden the discovery, access and usability of NASA's Earth Science Data and Research Model outputs.

Phil DeCola
Senior Policy Analyst, White House Office of Science and Technology Policy

Dr. Phil DeCola is a Senior Policy Analyst in the White House Office of Science and Technology Policy covering the areas of Climate Science and Earth Observations. He has also served as NASA Program Scientist for Atmospheric Composition in the Science Mission Directorate, and as the co-Chair of the U.S. Government's Climate Change Science Program Sub-group on Atmospheric Composition.

George M. Gray
Assistant Administrator, Office of Research and Development and Science Advisor, U.S. Environmental Protection Agency

On November 1, 2005, Dr. George Gray was sworn in to serve as the Assistant Administrator for the Office of Research and Development (ORD) at the U.S. Environmental Protection Agency. ORD is the 1,900-person, $600 million science and technology arm of EPA. Dr. Gray was appointed to this position by President George W. Bush and confirmed—by unanimous consent—by the U.S. Senate. EPA Administrator Stephen L. Johnson appointed Dr. Gray to serve as EPA Science Advisor on January 24, 2006.

The U.S. Environmental Protection Agency relies on sound science to safeguard both human health and the environment. ORD's leading-edge research helps provide the solid underpinning of science and technology for the Agency. ORD conducts research on ways to prevent pollution, protect human health, and reduce risk. The work at ORD laboratories, research centers, and offices across the country helps improve the quality of air, water, soil, and the way we use resources. Applied science at ORD builds our understanding of how to protect and enhance the relationship between humans and the ecosystems of Earth.

Prior to joining EPA George was a member of the faculty of the Harvard School of Public Health and Executive Director of the Harvard Center for Risk Analysis. His research focused on the scientific basis of human health risk assessment, on methods for characterizing and communicating risks, and on identifying and evaluating risk/risk tradeoffs in public health protection. George professional service has included membership on the National Advisory Health Sciences Council of the National Institute of Environmental Health Sciences, Food and Drug Administration Advisory Committees and a National Academy of Science/Institute of Medicine panel along with

active participation in the Society for Risk Analysis and the Society of Toxicology. George has a B.S. degree in biology from the University of Michigan and M.S. and Ph.D. degrees in toxicology from the University of Rochester.

He and his wife, Ann, and their two children make their home in McLean, Virginia.

ORD's Mission is to perform research and development to identify, understand, and solve current and future environmental problems; to provide responsive technical support to EPA's mission; integrate the work of ORD's scientific partners (other agencies, nations, private sector organizations, and academia); and to provide leadership in addressing emerging environmental issues and in advancing the science and technology of risk assessment and risk management.

Thomas R. Karl
Director, NOAA's National Climatic Data Center, United States Department of Commerce

Thomas R. Karl was born and raised in Evergreen Park, Illinois. He received his B.S. degree in Meteorology from Northern Illinois University, DeKalb, Illinois in 1973, his Masters Degree from the University of Wisconsin, Madison in 1974, and was awarded an honorary Doctorate of Humane Letters from North Carolina State University in 2002.

Dr. Karl is the Director of NOAA's National Climatic Data Center in Asheville, North Carolina, and is NOAA's Program Manager for Climate Observations and Analysis. He has served and continuous to serve on a variety of National Research Council Committees. He Co-Chairs NOAA's Data Management Committee. Dr. Karl is a frequent contributor to various news outlets. He has frequently briefed members of Congress and provided testimony on issues related to Climate Change. He has also briefed various members of the Executive Branch including the Presidents. Dr. Karl is a fellow of the American Meteorological Society and the American Geophysical Union, and a National Associate of the National Research Council. In 2002, he was elected to serve on the Council of the American Meteorological Society and ended his term in 2006.

Dr. Karl is author of many climatic atlases and technical reports, and has published over 150 articles in various scientific journals. He was identified as one of the most frequently cited Earth Scientist of the 1990s. His articles address climate, climate variability, and climate change. He has also served as Editor of the *Journal of Climate*

(1997-2000) and Lead Author, Coordinating Lead Author, and Review Editor of several IPCC reports, Co-Chair of the US National Assessment of Climate Change and Variability and recently completed the first Climate Change Science Program Synthesis and Assessment Report on Temperature Trends. He was part of the IPCC process that received the 2007 Nobel Peace Prize. Dr. Karl has also served as Editor or Contributor to a number of commercial textbooks on topics ranging from the 1988 U.S. drought to climate and biodiversity.

Jack A. Kaye
Associate Director, Research of the Earth Science Division, NASA's Science Mission Directorate

Jack Kaye currently serves as Associate Director for Research of the Earth Science Division within NASA's Science Mission Directorate. He has been a member of the Senior Executive Service since August, 1999, managing NASA's Earth Science Research Program. Earlier positions in his nearly 24 year career at NASA include being a Space Scientist at the Goddard Space Flight Center and Manager of the Atmospheric Chemistry Modeling and Analysis Program at NASA HQ. His academic training is in chemistry (B.S. Adelphi University, 1976; Ph.D., California Institute of Technology, 1982). As Associate Director for Research, Dr. Kaye is responsible for the research and data analysis programs for Earth System Science, covering the broad spectrum of scientific disciplines that constitute it. He represents NASA in many interagency and international activities and has been an active participant in the US Climate Change Science Program (CCSP) in which he currently serves as NASA principal and Vice Chair of the Subcommittee on Global Change Research, as well as NASA's representative to the Senior Users' Advisory Group for the National Polar Orbiting Operational Environmental Satellite System and to the Joint Subcommittee on Ocean Science and Technology. He is a member of the Steering Committee for the Global Climate Observing System. He has received numerous NASA awards, as well as been recognized as a Meritorious Executive in the Senior Executive Service in 2004. He was elected to serve as co-secretary of the Atmospheric Sciences Section of the American Geophysical Union (AGU) for 1998-2000. The AGU has recognized him on two occasions with a Citation for Excellence in Refereeing. He has published more than 50 refereed papers, contributed to numerous reports, books, and encyclopedias, and edited the book *Isotope Effects in Gas-Phase Chemistry* for the American Chemical Society.

Chester Koblinsky
Director, Climate Program Office, Office of Oceanic and Atmospheric Research, National Oceanic and Atmospheric Administration

As Director of NOAA's Climate Program Office and leader of NOAA's climate mission, Dr. Koblinsky oversees the development of NOAA's climate activities and manages the execution of its competitive research programs. NOAA's climate mission is to /"Understand climate variability and change to enhance society's ability to plan and respond." / Dr. Koblinsky joined NOAA in 2003 after a 25-year career as a research scientist and manager at NASA and the Scripps Institution of Oceanography. He has published over 90 scientific papers and lead the development of research satellite missions. He is a recipient of NASA's Medal for Exceptional Scientific Achievement.

Berrien Moore III
Director, Institute for the Study of Earth, Oceans and Space, University of New Hampshire

Berrien Moore III joined the University of New Hampshire (UNH) faculty in 1969, soon after receiving his Ph.D. in mathematics from the University of Virginia. A Professor of Systems Research, he received the University's 1993 Excellence in Research Award and was named University Distinguished Professor in 1997. Professor Moore's research focuses on the carbon cycle, global biogeochemical cycles, and global change as well as policy issues in the area of the global environment. In 2007 he was awarded the Dryden Lectureship in Research by the American Institute of Aeronautics and Astronautics (AIAA) and was among the network of scientists who contributed their expertise to the assessment reports of the Intergovernmental Panel on Climate Change (IPCC), resulting in that organization's designation as the 2007 co-recipient of the Nobel Peace Prize.

The Director of the Institute for the Study of Earth, Oceans, and Space (EOS) since 1987, he has simultaneously served on and chaired numerous government affiliated scientific committees (NASA/NOAA, The National Academies), including the NRC Committee on Global Change Research from 1995-1998 which produced the landmark report, "Global Environmental Change: Research Pathways for the Next Decade." Most recently he co-chaired the National Research Council's decadal survey, "Earth Observations from Space: A Community Assessment and Strategy for the Future."

His scientific committee service has spanned continents, including his 4-year tenure ('98-'02) as the Chair of the Science Committee of the International Geosphere-Biosphere Programme and his previously mentioned service as a lead author within the Intergovernmental Panel on Climate Change's (IPCC) Third Annual Report (TAR) which was released in Spring 2001. In July 2001 he chaired the Global Change Open Science Conference in Amsterdam and is one of the four architects of the Amsterdam Declaration on Global Change.

Professor Moore's current professional affiliations include the following: Member, Board of Trustees, University Corporation for Atmospheric Research (UCAR); Member, Advisory Council, Jet Propulsion Laboratory; Member, Scientific Advisory Board, Max Planck-Institute for Meteorology, Munich, Germany; Member, National Academies' Space Studies Board; Chair, Steering Committee, Global Terrestrial Observing System (United Nations Affiliate); Member, Board of Directors, University of New Hampshire Foundation; Member, Board of Trustees, Mount Washington Observatory, North Conway, NH; Member, Science Advisory Team-The National Polar-Orbiting Operational Environmental Satellite System (NPOESS/NOAA).